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shows admixture more convincingly than arts, but not more in reality to those who are in a position to make comparisons.

The remark of Prof. O. S. Mason is a reliable statement of the question for the present, that "the Easter Island images are the most interesting of the archeological enigmas." Mr. Thomson is preparing a monograph on Easter Island for a forthcoming Smithsonian Report, from the material gathered on the Mohican survey and from other sources, which will allow a judgment to be passed on these questions, and which will give all that is known about the archeology and ethnology of this interesting field.

ARE THE GERMAN SCHWEINE-SEUCHE AND THE "SWINE PLAGUE" OF THE GOVERNMENT OF THE UNITED STATES IDENTICAL DISEASES?

ONE of the most valuable and interesting contributions to the literature of the German Schweine-seuche is that of Bleisch and Fiedeler.[1]

The investigations of these observers appear to have been most carefully made, and every necessary precaution used. They extended over fifty-two swine, in an outbreak in which sixty of sixty-three died. According to their statement, the same microorganism to which the name "Loeffler-Schütz" has been given, was found in every case, of which they say: "While the dispersion of the bacteria in the organs and blood of the inoculated rabbits and hens is in general about equal, these investigations show that in swine they are most numerous in the mucus filling the bronchial tubes which lead to the diseased portions of the lungs, and less numerous in the caseous parts, while equally scarce or wanting in the gray-red hepatized portions as well as in the spleen and liver.

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[1] "Beitrag zur Kenntniss der Schweine-seuche." *Zeitschrift für Hygiene* (Koch's), Vol. 5, p. 400, and *Archiv für wiss. und prac. Thierheilkunde*, Vol. 5, 1889.

The most interesting and important point regarding these observations is the relation of the lesions in the intestines to epizoötic swine diseases in this country. *In the fifty-two hogs examined we do not find intestinal lesions mentioned once ;* but do meet with such expressions, over and over again, as, "*Nothing abnormal* in the intestines." On the contrary, pulmonary changes varying in degree were present in each case, and formed the essential lesion.

Summing up the results of their microscopical observations, these investigators say that "the skin and sub-cutis showed no changes," which is somewhat contradicted by Schütz and Loeffler's experience, both of whom frequently mention the presence of "enormous œdema." Going on they say, "In most cases the diseased changes were limited to grayish-red hepatization of the inferior portion of the anterior lobes of the lungs and medullary swelling of the lymph-glands. Further lesions were also present in the middle and inferior lobes; the bronchial tubes always formed the central point of these consolidations. Where the disease had become more progressed the hepatized tissues were more dry, and yellowish-red in color; coseation was present in still older centers. *In the other organs, especially the cutis and sub-cutis, liver, kidneys, bladder and gastro-intestinal canal, no pathological changes were to be seen.*

"Our investigations show that we have had to do with an exceedingly infectious disease of the lungs having a chronic course, *which can extend to healthy animals without any contact with diseased ones* (hence not contagious), and that the infecting element, in almost all cases, finds its way into the infested organism by means of the lungs. *In all cases the pathological changes do not extend much beyond the point of invasion. The disease retains, almost invariably, a local character. Especially do we entirely miss any mentionable changes in the spleen and intestines.*"

The authors also quote Schütz upon this point as follows:

"Schweine-seuche (swine plague) is an inflammation of the lungs and pleuræ which is found with necrosis of the diseased portions of the lungs and mild phenomena of infection, little or no swelling of the spleen, slight swelling of the parenchymatous organs, and gastro-intestinal catarrh. When the disease assumes a chronic course caseous conditions in the lungs are produced."

"*Caseous changes in the mucosa of the stomach and intestines have not yet been observed.*"

The desperate attempts which have been made to graft a second "*wide-spread epidemic disease*" upon the porcine interests of this country, under the name of swine plague, which should be a pest, something which sweeps life away, both by the Agricultural Department, and its notorious "Board of Inquiry," as well as by Prof. Welsh, of Johns Hopkins University, Baltimore, and to establish the identity of this hypothetical and totally non-existent "pest" with the Schweine-seuche," demand some attention here.

As is well known, it has been the writer's endeavor to protect the hog-growers of the country from the absolutely baseless assertions of their government, and it is appropriate to call attention to the fact that this second "wide-spread epidemic among the hogs in this country," this terrible bureaucratic pest, never made its appearance until the author had made public the results of his earlier investigations in Nebraska. The report in which this second pest is first described is dated 1886, but was not published until 1887.

In a recent letter sent to the agricultural press of the country, and in which the Agricultural Department of this country cries "baby," it is claimed that the work of that department has been honest and scientific. If it has, then, why cry for support? In that report of 1886, this second terrible pest is described as a pulmonary trouble pure and simple. In the next report, of 1887 (issued 1888), we cannot tell what it is, for though honest and scientific in its work, the government so mixes up things that no human being can tell what this pest really is. We are told that "the lung lesions point to the existence of swine plague, and that the intestinal lesions indicate that of hog cholera," also in the same pig; that this pest is an "infectious pneumonia;" of "the difficulties attending investigations of diseases which have their seat in the lungs," though the government does say that "*in none of these experiments was the disease reproduced*," and then it says, when speaking of its correct "diagnosis," "The disease just described cannot fail to be recognized, as it seems to be the only severe disease of the lungs among swine of which we have any knowledge."

Now, when we read all those quotations, and compare them with the statements of the essential lesion of the German "Schweineseuche," and when we read that the government claims the germ of its second "wide-spread plague" is identical with that of the German disease, it does certainly look as if the government work has been honest and scientific; even more so, in fact, than when it carelessly claimed of its non-existing micrococcus of 1880 to 1885, that "the evidence furnished is all that should be necessary to decide a scientific question of this kind." But as then, so now, the work of the government is not and has not been either careful or scientific, if we can believe a single one of its assertions, for though it did give "evidence which should decide a scientific question of this kind," although it does seem to show in what we have quoted that the German and government plagues are really and truly pulmonary in character, and nothing else, still they make other equally honest and scientific assertions which, if the German evidence of Professors Loeffler and Schütz, and these two later observers, can be taken as correct, must certainly force any honest man to see that the government's assertion as to its "swine plague" being an "infectious pneumonia," and identical with the German disease, is neither careful nor scientific; for, in that same report of 1887, these honest (?) observers tell us of *Intestinal lesions!* "In the severe types of this disease there are very extensive lesions of the large intestines." And a government observer did say, in April, 1888, that some investigators think that the bowel lesions of hog cholera and the lung lesions of infectious pneumonia are caused by the same germ.

Do such assertions look like true, honest, and scientific statements? Can any ordinary layman see any signs of identity between a disease in which "there are very severe lesions in the large intestine," and this German disease, in which there was not a single disturbance in the intestines in a single one of 52 hogs most carefully examined, as well as in those studied with perhaps still greater exactness by both Professors Schütz and Loeffler?

I am perfectly well aware that lesions similar to those found in the large intestine have also been found in hogs in Germany, but think they require an entirely different interpretation. These intestinal lesions were first described by Roloff in 1875, under the name of "Chronic Caseous Enteritis in Swine;" and it is a very singular fact that from that time until now not one single case of such lesions in swine has been described by German observers. Professor Schütz was inclined to the opinion that these so-called "characteristic lesions" in the large intestine, so common n, but not necessary, to the true American swine plague, might also be found to belong in the pathological picture of the German Schweine-seuche, and in my earlier writings in several periodicals I inclined to the same opinion, being misled by the more or less close resemblance in the description of the germs of the German disease to the morphological appearances of those of the American. I, however, entirely changed my opinion as to identity between the German Schweine-seuche and the true swine plague of this country, called by the Government "Hog Cholera," in my full report published in the spring of 1889. Notwithstanding this latest and only real authentic publication of my ideas on this subject, a late writer, Prof. Welsh, of the Johns Hopkins University, says, in a "Bulletin" of that institution, December, 1889: "Much confusion has resulted from Dr. Billings' attempts to identify this organism (of 'Hog Cholera') with that of the Schweine-seuche."

I pronounce that assertion to be unequivocally false. The "confusion" has been raised entirely by careless, unqualified or ignorant writers who have endeavored to prove that the government swine plague is identical with the "Schweine-seuche."

To show how prejudiced and biased this committee may be, and how weak a man can be, though honored with a responsible position in a respectable university, and how economical of the truth such a person may be, I quote a few lines from my report on swine plague, where I am endeavoring to show that the German Schweine-sueche cannot be identical with the real American swine plague, but is really nothing more or less than the "Wild-seuche," a disease differentiated by Bollinger from anthrax by the absence of *B. anthracis*, though he did not discover its germ, the microscopes and methods of investigation not being equal to that task at the time.

I said that the Schweine-seuche was not the swine-plague ("Hog Cholera") because, first, enormous œdema and deformation of the body thereby does not occur in swine plague; second, because the tendency to hæmorrhagic effusions is not a constant phenomenon, though frequently present, but seldom to such an extended degree as in the German disease; third, because the so-called "characteristic" intestinal lesions seem to be entirely absent.

Hence it seems to me that my conclusion is correct, that the organism discovered by Loeffler in swine, and the disease resulting from its action, has no important relation whatever to the origin and nature of the cosmopolitan swine plague.

It seems to me that the above language is plain enough to be understood by anybody.

That even foreigners can read the English language more correctly than one native to a country where it is spoken, I quote from the *Jahresbericht über pathogenen Microorganismen*, 1889, p. 130, where the reviewer of my work says: "While in a previous work I had the opinion that the American swine plague and the German Schweine-seuche were identical diseases, in this book (my Swine Plague) I most emphatically contradict this opinion, and claim the Schweine-seuche to be identical with the Wild-seuche," which latter assertion the reviewer questions.

Having thus most completely disposed of the careless inaccuracies of my critics, I will say that I am still of the same opinion, and it remains for German observers to show that I am not correct.

It will be remembered that the observations of Bleisch and Fiedeler extended over fifty-two diseased swine, not one of which presented anything abnormal in the intestinal canal. I will not take the trouble to refer to the exact number of swine examined by Loeffler and Schütz, but it was about ten.

Now I make bold to say, and do it with an experience extending over 1500 swine, on every one of which careful autopsies were made, that no man can examine not sixty but ten swine in this country in a large outbreak, where a pestiferous disease is raging and the loss anywhere from thirty to seventy per cent., and not find a majority of the cases presenting some form of a caseous, ulcerative or follicular lesion in the large intestines.

This should be evidence enough that the two diseases are not identical.

This Baltimore authority (who, by the way, is an almost entirely unknown quantity in the annals of bacteriology, for which assertion I refer the reader to the Annual Report previously quoted), and the scientific Department of Agriculture of this country, as well the members of the celebrated "Board of Inquiry," have, as is well known, done their utmost to injure the swine interest of the west by publishing to the world that the Government swine plague is identical with the German Schweine-seuche. It has been shown that had the government stuck to its original text, that its swine plague was a pneumonia only, it had all the evidence on its side. But it has also been shown that the government did not stick to its text, that its assertions have been neither accurate nor scientific, and that in its swine plague there were to be found fully as severe intestinal lesions as in the real hog-cholera, and the Board of Inquiry even went so far as to endorse this view. It even asserted that both the germs of the government pest and the hog-cholera produce almost identically the same lesions (I cannot see where they differ), and they both can be in one and the same hog at one and the same time.

Poor piggy!

Compare this latter statement with all the examinations of German observers.

Can we find anywhere a particle of evidence in favor of any such peculiar condition of things?

Thus far we have been unable to find any evidence of but one disease and one form of micro-organismal etiological life, and all the evidence goes to show that pulmonary lesions are its specific complication, while intestinal are conspicuous by their absolute absence.

Nowhere do we find any description of any such organism as the hog-cholera germ being mixed up with the Schweine-seuche bacterium.

There is, however, another side to this question, and as I am not writing as an advocate, but as an honest searcher for the truth, it is but right to present it here. It has been previously mentioned that Roloff described intestinal lesions the exact counterpart of those frequently met with in the true American swine plague, and that Schütz, in 1886, thought that they might also belong to the Schweine-seuche.

It is also known that Schütz looked upon the "Schweine-pest" of Denmark as identical with the English "swine fever," and our true swine plague or hog-cholera, and that he did not think it identical with the Schweine-seuche, and that he did think intestinal lesions its chief characteristic in contradistinction to the pathognomonic pulmonary lesions of the Schweine-seuche is evident when he says the "*Schweinepest* is a disease of the digestive tract, by which especially the cæcum and colon are complicated."—B. & F., l. c., p. 434.

This certainly should go to show that Schütz had no actual knowledge of any swine disease in Germany with marked intestinal lesions up to the date of publication, July 3, 1889, or else those authors would have known of it, except the historical description of Roloff's in 1875.

Since B. and F.'s contribution, however,—in fact very recently—there have been published in Germany,[2] some observations which again describe the presence of the lesions observed by Roloff in a most exact manner, and, singular to say, with scarcely any mention of pulmonary complications being present.

From the title selected by Peters, "Schweine-seuche," and from the entire context, it is very evident that he came to the same conclusion which I did on first reading Schütz's descriptions, for he quotes Schütz on this subject as follows: "In anticipation of the future I will draw attention to a disease of swine described by Roloff, under the name of caseous enteritis, which most probably should be recognized among the pathological processes caused by the the ovoid bacteria" of Schweine-seuche. Peters seems to be well aware of the fact that Schütz did not meet with these lesions in any of the hogs he examined, for he says: "We distinguish two etiologically different diseases, the Rothlauf of swine, and the Schweine-seuche: the first is pure septicæmia, caused by a bacillus, the last a general disease caused by an ovoid bacterium, in the course of which, so far as known, a multiple mortifying pneumonia is developed. The anatomical picture of such a pneumonia was at least presented by all the swine examined by Prof. Schütz."

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[2] "Die Schweine-Seuche." Peters. *Archiv für wissen. und pract. Thierheilkunde.* Berlin, 1890.

The work of Bleisch and Fiedeler seems to have been unknown to Peters. Aside, then, from the before-mentioned reference to Roloff's observations in 1875, it is evident that the German investigators acknowledge but two specific swine diseases in that country, and while I do not desire to be a special pleader for my own hypothesis as to the conditions there, still it is only fair to call attention to a peculiar result of the appearance of the Loeffler-Schütz Schweine-seuche in the pathological arena, and that is, we hear no more of the "Wild-seuche." As previously noted, Peters follows Schütz implicitly, and assumes the latter's hypothesis as to the Roloff lesions in the intestines to be unqualifiedly correct, and says, "for the correctness of the assumption that the caseous enteritis should be classed with the Schweine-sueche, I am in a position to furnish the necessary material.

"The necroscopies which I have made upon such swine did not all give a corresponding result, *on the contrary, the bacterial results were the same in every case, namely, the presence of ovoid bacteria.* In four of the cadavers the pathological changes were exclusively in the large intestine, in one other alone, besides these, there was a multiple necrotic pneumonia."

It is not necessary to quote the details of the microscopical examination of these five hogs, of the results of which Peters says: "Through the previous examinations it can well be considered as proven that all the swine examined had suffered from one and the same disease which was caused by the Schweine-seuche bacteria. We may also conclude that the multiple inflammation of the lungs, which was exceptionally and only present in the cases investigated by Schütz, is not an integral element of the pathological picture of Schweine-seuche, and that the hypothesis of that observer has been proven. Inflammation of the lungs occurs in this pest, as it presents itself here, probably much more frequently than caseous enteritis, as in the five cases examined by me it was only present in one, and there as a secondary local infection. To this assertion I find myself the more justified in that at the time I did not know of the identity between the caseous enteritis and Schweine-seuche. I had met with the first much the more frequently, without its being complicated with pulmonary lesions."

Let us consider this evidence as unprejudicedly and carefully as we can.

1. What have we in favor of the identity of the disease studied by Peters and that investigated by Loeffler, Schütz, Bleisch, and Fiedeler?

Nothing but that most unreliable of all evidence, the presence of a morphologically (apparently) identical micro-organism.

This kind of evidence is the most misleading and dangerous which can possibly be relied upon.

Let us suppose that it were possible to infect five hogs with the germ of ether Texas Fever, as it is called, the hen-cholera, rabbit-septicæmia, the weasel pest, or the corn-stalk disease, all of which are ovoid and belted bacteria, morphologically not safely to be diffentiated from those of the Schweine-seuche—what then?

But the germs of the last disease have no movement, and do not grow on potatoes, say some!

Well, what then?

There is no evidence that Peters made any such examination of a culture, as he certainly would have mentioned it.

2d. What have we against any such identity between the disease investigated by Peters and the Schweine-seuche?

In the Peters case we have four hogs with no pulmonary lesions whatever in comparison with over 60 examined by the other observers, in none of which was there a single intestinal lesion.

To my mind, this is conclusive evidence that, notwithstanding the apparent resemblance between the microorganisms, as concluded by Peters, the disease studied by him was the hog-cholera of this country; and even if we take Schütz's conclusions, not the Schweine-seuche, but the Schweine-pest of Denmark, which is now generally admitted to be the same thing as the pest that decimates our herds.

If any value can be placed upon the testimony from Germany as we now have it before us, it must be admitted that it is still all in favor of my own conclusions as published in my complete report upon swine-plague in this country; that is, that the Germans are blessed with three distinct swine-plagues, varying, according to present evidence, in extent as follows:

1st. The Rothlauf, or Rouget (erysipelas).

2d. Hog-Cholera, or the Swine-pest, or genuine swine-plague.

3d. Schweine-seuche or the Wild-seuche.

While according to present evidence the third is more prevalent than the second of this series, I have placed it last because I desired to quote some peculiar testimony given by Bleisch and Fiedeler.

The Wild-seuche takes its name from the fact that attention was first called to it from its occurring among the wild animals in the Royal preserves, especially deer, which in Germany are called "das Wild." Up to the time of Bollinger's investigations this disease was classed with anthrax, but as said before, Bollinger did not discover its germ at that time. Whether or not future investigations will justify my hypothesis (see my report) that this Wild-seuche and the Loeffler-Schütz Schweine-seuche are one and the same disease I know not, but it is positively certain that all the evidence is at present in my favor.

It is very singular how limited the study of this question has been in Germany, since Schütz's first investigations in 1885, notwithstanding the extraordinarily favorable conditions for such work in the veterinary schools and laboratories of that country.

The fact that the Wild-seuche attacks cattle and hogs on the same territory and under the same circumstances is absolute proof that it has no identical connection with our real swine-plague.

The investigators of the government of the United States assert that its peculiar swine-plague is identical with the German, and mainly upon bacteriological resemblances. I freely admit that should Peters' assertions become proven these observers would have a strong case against me, but I place equally strong reliance that they have none upon the previously noted fact that in no other reported investigations in Germany have we mention of intestinal lesions with or without pneumonia in a single case of the Loeffler-Schütz disease, and also upon Schütz's conclusions upon the Danish swine-pest and the disease in England.

On the other hand, in all the practical experiences of the past forty years in this country among our farmers we have no record of a single pestiferous disease of a "wide-spread" character attacking cattle and hogs at the same time and under the same conditions.

Have we any such evidence with regard to the German Schweine-seuche?

Although not so exact as could be desired, we have some.

Bleisch and Fiedeler say that "the owner of the stable (in which the hogs they had examined had died of Schweine-seuche) placed fourteen calves therein, and that some of them died, which caused them to investigate whether the disease Schweine-seuche was transmissible to calves.

"In order to prove this they inoculated two calves with a bouillon culture of known virulence, the one subcutaneously with 1 ccm., the other in the right lung with ½ ccm. of the same.

"The first died six hours after the inoculation."—P. 429.

The same microorganism as those injected was found in all the organs, and controlled in the necessary manner.

The second calf was not seriously affected. Insignificant in extent as this evidence is, it points in support of my hypothesis and assertions.

1st. The identity between the Schweine-seuche and the Wilde-seuche.

2d. The non-existence of the Schweine-seuche in this country.

The case would be strengthened had Bleisch and Fiedeler had opportunity to examine one of the calves reported to have died by the owner, and made the necessary control experiments from the same.

Another point must not be overlooked, and which contradicts the assertion of the Government that the Swine-plague and the German Schweine-seuche are identical, is the immense difference in the results following subcutaneous inoculations of the respective germs directly in the lungs of healthy swine.

The Government admits that "in none of these (its) experiments was the disease reproduced," even though they injected as high as 5 ccms. of a culture "directly into the lungs," (Report, 1887.) The German investigators were positively successful with so small a dose of culture as one-third of a ccm., the animal dying in ten hours, while the Government swine lived "forty-one days" and were killed, having been seriously ill. The Germans also produced the same lesions in their inoculated swine as they found in those infected under natural conditions, and say: "Confirmatory also was the presence of grey-red hepatization in the lungs, which in nothing, not even in the bacteriological results, differed from the natural disease as seen in its earliest stages."—P. 438.

It is but common honesty to admit that the Government investigators do report having finally killed a hog by the injection of 9 cubic centimeters" !!! of culture into the lung, but what kind of a germ with any virulence in swine would not kill in such doses as that. Prof. Welsh also reports similar results following the injection of 8 ccms. into the right lung of a pig, of the same germ.

Such experiments as that are more contradictory than confirmatory as to any identity between the swine plague of the government and the German Schweine-seuche. On the other hand, all attempts on the part of the government investigators to produce the German Schweine-seuche by subcutaneous inoculation have utterly failed. Prof. Welch does not mention any such experiments. On the contrary, we may find some reported by Loeffler and Schütz as to the Schweine-Seuche.

First, as to Loeffler, who says on July 5 (year not given) he injected two young swine in the skin of the belly and leg respectively. One of them was dead in the stable on the morning of July 7 (and this by subcutaneous inoculation). Enormous œdema of the skin, lungs, hypostatic, etc. The second swine was not seriously sick.

Schütz injected 2 ccm. of a bouillon culture under the thin cutis of the inside of the hind leg of two young swine on the 26th, at 5 P. M. One died twenty-four hours after the inoculation; the other died exactly forty-eight hours after inoculation.

On the 14th of July Schütz inoculated subcutaneously another hog with 1 ccm. of a bouillon culture. It died on the night of the 16th, about two and one half days.

On the 16th of June, at 11 A. M., Schütze injected 1 c.cm. of a bouillon culture into the lung of an old hog. It died on the night of the 18th, about two and one-half days.

Let us compare these results, following the subcutaneous and intrapulmonary injection of the Schweine-seuche germ, with some others reported by the government where less than 9 ccm. were used.

" Dec. 6, two pigs, Nos. 43 and 47, were inoculated in the thorax as already described (into the lung, with a hypodermic syringe.having a needle about three inches long), No. 43 receiving 1½ ccm., and No. 47, 3 ccm. No. 47, inoculated Dec. 6, *killed* Dec. 11th,—five days. No. 43, inoculated Dec. 6, lived to Jan. 23,—forty-eight days.

There seems to be too vast a degree of difference between this government germ and that of the German disease, even with the amount injected vastly in favor of the bureaucratic organism, to warrant any very strong claims for identity between the two.

Pathobiological Laboratory, Chicago, Ill.,
Feb. 13, 1890.